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YAWS*

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MR. PRESIDENT AND GENTLEMEN,—The selection of Yaws for discussion by the Society seems to be particularly timely and appropriate. On these grounds I wish to congratulate you for having chosen a subject so likely to provide the means of eliciting a lively and interesting debate.

Yaws is a disease very closely allied in its etiology, pathology and treatment to syphilis, but appears to differ mainly in its method of conveyance from the infected to non-infected, in its lack of hereditary transmission, in several important features in symptomatology, and finally in response to treatment.

The home of yaws at the present day is within the true tropics, between Capricorn and Cancer ; its chief ravages are mainly confined to the old world ; its distribution in the new (West Indies, Venezuela, Guianas and Brazil), being directly due to the infamous influence of the slave trade. Thus has Fate decreed that the gift of syphilis from the new world to the old, consequent upon the Spanish Conquest, should be repaid in kind some hundred years later by the exportation of yaws from Africa by Negro slaves.

Yaws is known by a variety of synonyms in different countries, but its true nature is adequately expressed by the term "Framboesia," which more picturesquely describes the raspberry-like appearances of the secondary rash. At present yaws is spreading with alarming rapidity in Central Africa, so that in Kenya Colony and Tanganyika Territory it is a cause of no little concern to the Government ; it is prevalent, too, in Ceylon, the Pacific Islands, New Guinea, the West Indies and Brazil, while more sparingly distributed in the East Indies,

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Southern India, Assam and the Malay States. In China it appears to be rare. My personal knowledge of yaws has been gained in the Fiji Islands and in Ceylon, where it is, or was, extremely prevalent. Yaws is possibly the disease which affected the Israelites during their emigration from Egypt, and was possibly known to the Avicenna. After the discovery of America we find frequent references to a disease which must have been yaws in the writings of Piso (1648) in his work "De Medicina Brasiliensis." Rochefort, Breton (1665), and Labat (1694), in their descriptions of the Caribs of the West Indies, also wrote about yaws.

Possibly, too, yaws was at one time prevalent in Europe—Sir Patrick Manson frequently used to refer to a disease known as "sibbens" or "sivyens," which occurred as an outbreak in Scotland in August, 1769, which was thought to have been imported by sailors coming from the West Indies, while in an old book, "A Comprehensive Treatise upon the Symptoms, Consequences, Nature and Treatment of Venereal or Syphilitic Disease," by F. Swediaur, in 1821, I find "that yaws never attacks the same person twice, and is comparable with what the Scots believe of their 'sibbens'."

Yaws is highly contagious, and although there is some evidence that the virus is often conveyed by insect bites, yet the commonest method is by intimate contact of the sick with the healthy through some breach of surface or abrasion of the skin.

The disease is due to a small spirochæte, *Treponema pertenue*, which was discovered by Castellani in Ceylon in 1905, and which, according to most authorities, is indistinguishable from *T. pallidum*. The organism can easily be recognised in scrapings from secondary lesions, and sparingly in the ulcerations and other manifestations of the tertiary period.

Yaws is neither hereditary nor congenital. A pregnant mother does not give birth to a child suffering from the disease, nor will it subsequently develop yaws unless it is directly inoculated. A yaws-stricken infant may convey infection to its mother by direct contact in feeding, and conversely, a yaws-stricken mother can infect her own child in a similar manner. Most infections occur during childhood, or at any rate before puberty, more males than females being affected.

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The symptoms of yaws, as in syphilis, may be divided into three stages, primary, secondary and tertiary :—

Symptoms.—*The Primary Lesion or "Mother Yaw."*—According to Sellards, the incubation period of the primary lesion in man in experimentally inoculated yaws is usually three and a half weeks, though in experimental inoculation into the higher apes it may be as long as three months. The primary lesion may appear as a granuloma or as a papule at the site of inoculation, and is known sometimes as a "framboesoma." It may develop at the site of some old skin lesion or abrasion. Ordinarily it is extragenital, and may appear on any part of the body—especially on the lower portion of the leg. In the case of nursing women it may be seen on the breasts, or on the hip, where the babies are generally slung, or on the lips of sucklings. The primary lesion may be single or multiple, or be so minute as to escape attention. The lesion, in becoming larger, becomes covered with a yellowish honey-like secretion or scab. At this stage it is known as the "mother" or "master yaw."

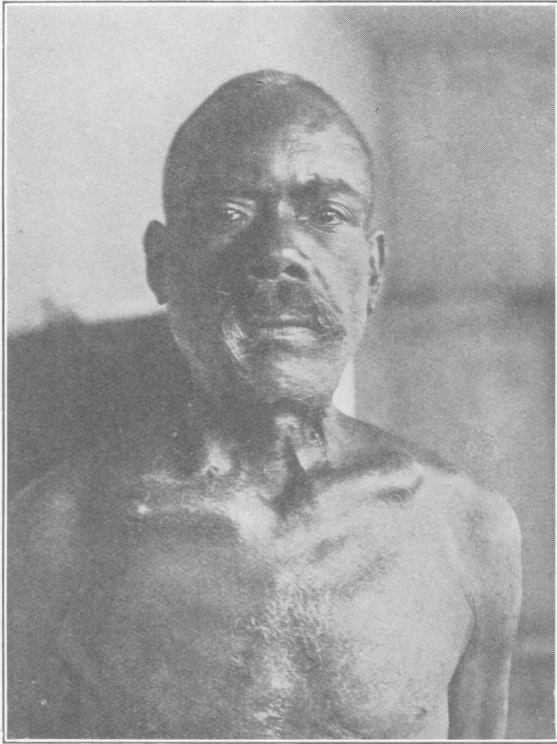
The appearance of the primary lesion may be preceded by some constitutional disturbance, occasionally there is severe fever with aching pains in the long bones. The lymphatic glands in the immediate vicinity of the lesions are early affected and become enlarged.

The secondary stage is sometimes ushered in by a fine light-coloured branny desquamation; often this is so slight as to be overlooked. When the furfuraceous patches have been present for a few days, minute papules appear in them. The true framboesia, or rash, from which the disease takes its name, breaks out three months after the primary lesion. The characteristic "framboesia" varies very much in size and probably first arises in the immediate vicinity of the primary sore. The itching which heralds the eruption may be very considerable. The papules first occur in groups, the larger being surrounded by groups of satellites.

Autoinoculation is probably responsible for the appearance of the lesions in a symmetrical manner, wherever the skin or mucous membranes come into close contact. Yaws lesions, however, are unknown on the mucous membranes themselves. The yaw usually attains its maximum development in two weeks, and for several longer it remains stationary before commencing to

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shrink. The crust then shrivels and separates at the periphery, disclosing at the site of the former fungating mass a slightly thickened spot of fairly sound skin which may later become pigmented. These pigmented plaques which appear reddish-purple on a white skin, and dark brown or black on a black skin, may be distinguished for several months after the subsidence of the secondary stage, and are more especially noticeable on the palms



TERTIARY YAWS, PERIOSTRITIS OF CLAVICLE. Fiji.

of the hands. A circinate rash, resembling a circinate syphilide, is sometimes seen, and papular lesions, known as "acuminate papules" much resembling a follicular syphilide, has been noted.

The serum of patients, especially in the secondary stage, gives a positive Wassermann reaction, making the differential diagnosis from syphilis by this means alone impossible to determine.

Tertiary Stage.—It sometimes happens that the secon-

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dary lesions, in place of being absorbed, break down and form a gummatous ulceration, which may extend and cause great destruction of the tissues and disfigurement, especially of the face, which may last for years. The cicatricial contractions may cause immobility of joints and gradual disablement. Large fungating ulcers of the



TERTIARY YAWS, ULCERATION OF LEFT LEG, PERIOSTEAL
NODES OF TIBIA AND YAWS DACTYLITIS. Ceylon.

limbs and ankles greatly resemble similar gummatous ulcerations in tertiary syphilis.

Lesions of the Hand.—A scaly condition of the palms of the hand, with superficial serpigenous ulceration, may be present for years, and a multiple dactylitis with uniform swelling of the phalanges with onychia, paronychia, atrophy of the nails, and subsequent deformities, is often observed.

Lesions of the Feet, known in Ceylon as “dumas,” and in the West Indies as “crabs” or “crab yaws,” is a very characteristic condition. When yaws develops on the

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soles of the feet, in consequence of the denseness of the epidermis, it causes much suffering—spreading in a lateral direction under the leathery epidermis it may attain a large size. After a time the epidermis gives way, and the ulceration spreads in a radiating manner. These crab yaws may last a lifetime and cause much disablement. Chesterman has suggested that their persistence is due to the fact that these foot lesions form a fixation point for *T. pertenue*. When these granulomata heal,



TERTIARY YAWS, SYNOVITIS OF RIGHT KNEE, PSEUDO-ELEPHANTIASIS FROM SCAR TISSUE AND DEPIGMENTATION OF SKIN OF DORSUM OF FOOT. Ceylon.

deep fissures or cracks are left which in Dominica are known as “clavus.”

Periostitis, Osteitis and Epiphysitis.—Periosteal nodules are frequently met with on the anterior aspect of the long bones, especially the radius, ulna and tibia. At first these swellings are hot and exquisitely tender, and after the subsidence of the acute stage, hard, firm, persistent nodules remain.

A diffuse osteitis of the long bones, especially the ulna and tibia, results in sabre-shaped and bowed extremities, and occasionally similar lesions are noted on the phalanges resulting in deflection and much deformity. The rare-

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ying process is shown by spontaneous fracture of the bones and absorption of the head of the femur and the phalanges resulting in shortening.

A chronic periostitis of the clavicle has been observed by myself in Fiji. The bone changes are accompanied by intense rheumatic-like pains. An elephantoid condition of the lips is frequently observed in tertiary yaws.

Synovitis.—A chronic synovitis analogous to that of tertiary syphilis is often associated with tertiary bone lesions, and sometimes with disorganisation of the joint.

Gangosa.—A destructive rhinopharyngitis causes great disfigurement in yaws-infected countries, especially in Ceylon, Fiji, Porto Rico and Guam. It usually commences as an ulcer of the soft palate, and spreading laterally it makes a clean sweep of the palate, the soft parts, cartilages, and bones of the nose, but spares the upper lip. A most offensive odour is given off from the ulcerated surface. It is always a long-standing chronic disease. As a rule, the larynx is spared; though phonation may be retained, articulation is seriously impaired. It usually occurs in middle-aged people, though it has been seen in children. In West, Central and East Africa it is often found associated with the bone lesions in yaws.

Later Manifestations.—Under this heading may be described two very anomalous and interesting conditions. "*Goundou*" and "*Juxta-articular nodules*."

Goundou.—"Anakhré" or "Gros nez." This condition has long been known in West Africa, where it was first described as the "Horned men of Africa" in 1882. This most amazing deformity has recently (1925) formed the subject of a well-illustrated monograph by Botreau-Roussel. Later observations have shown that it has a wide distribution in Central Africa, West Indies and South America, while Roussel has pointed out that a skeleton in the Duputyren Museum in Paris, labelled *Leontiasis ossea*, is really an example of goundou.

A similar condition has been observed in higher apes, especially chimpanzees, and in recent years a good example was to be seen in one of these anthropoids in the Zoological Gardens. The disease has to be distinguished from acromegaly, rickets, Paget's disease, and true *Leontiasis ossea*.

Goundou follows closely upon secondary yaws, and

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may be seen in quite small children, as in one case quoted by Roussel in a child of one and a half years. The earliest symptoms are severe with persistent headache and afterwards associated with a sanguino-purulent discharge from the nostrils and the formation of ivory-hard symmetrical swellings the size of a bean on the side of the nose. The swellings affect the nasal processes of the upper maxilla, sometimes the hard palate, and even the mandible, producing the most amazing deformities. The swellings increase and attain the size of an orange, even of an ostrich egg, and finally they encroach on the eyes and interfere with vision, or even may destroy these organs. The nostrils are bulged inwards and obstructed. That these lesions are indeed part of yaws has been shown by Botreau-Roussel, who, by inoculating cases with serum full of *treponemata* from secondary yaws, has proved the goundou cases to be immune; they are, moreover, associated frequently with tertiary bone lesions, and may in the early stages be aborted with injections of salvarsan. Intelligent natives have always believed goundou to be identical with yaws. Treatment consists of incising and displacing the periosteum and chipping away the bony outgrowth by means of a chisel.

Juxta-articular Nodules.—Fibrotic tumours, situated over the olecranon or the lower end of the femur and other situations, are now by common consent regarded as a tertiary phenomenon of yaws. Originating subcutaneously and apparently attached to the tendon insertions, these nodules rarely reach the size of a small orange. Juxta-articular nodules are usually multiple and occur in the neighbourhood of joints. Remarkably painless, they rarely ulcerate or suppurate. These nodules are most frequently observed in West and Central Africa, and there are apt to be mistaken for cysts of *Onchocerca volvulus*.

Skin Lesions.—Depigmentation of large areas of skin, often marking previous ulceration, is common in yaws, while the contraction of skin may lead to partial ankylosis of joints, obstruction of lymph channels and pseudo-elephantiasis.

Immunity.—It was already known to Swediaur (1821), that yaws rarely attacks the same person twice. In that belief from time immemorial Fijian mothers have been in the habit of inoculating their children in infancy

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against yaws to protect them against subsequent attacks of the disease. Sellards and Goolpasture have shown that the immunity is relative only, for they have succeeded in reinoculating patients with yaws who had undergone a course of curative salvarsan treatment.

Relation of Yaws to Syphilis.—Is yaws syphilis; is it a modified form of syphilis; is it a distinct disease; is it the old world form of syphilis; was yaws common there before the introduction of syphilis in the sixteenth century; or did yaws exist in South America before the Spanish Conquest? (An ancient Inca skull from Peru described by Letulle shows bone lesions suggestive of goundou.)

All these issues I wish to bring before you for discussion to-night. At any rate, the clinical aspects and pathology of these diseases are closely related and the *treponemata* are absolutely identical. Both diseases give a positive Wassermann reaction, and in certain aspects can hardly be distinguished from one another. Apparently saturation of a *community* with the yaws virus produces a relative immunity to syphilis; on these grounds may be explained the well-authenticated fact that syphilis is absent entirely amongst native Polynesians of Fiji, Tonga and Samoa, in whom yaws is especially prevalent. I have never seen a case of chancre or of secondary syphilis in a Fijian, nor had the late Dr. B. G. Corney, in twenty years' experience, and this view is again emphatically expressed in the Medical Report of Fiji for 1926. Albeit at the same time, the more familiar appearances of true syphilis are seen in the Indians who live side by side with the Fijians. I can go so far as to say that the parasymphilitic affections such as tabes and G.P.I. are unknown amongst the latter.

There is good evidence that both diseases may occur in the same individual (Powell and Charlouis), while Neisser reproduced yaws in ourang-outangs previously inoculated with syphilis. Yaws may die out, as in Guiana, but syphilis may remain.

The subjoined table shows the main distinctions between yaws and syphilis.

YAWS	SYPHILIS
Not congenital.	Congenital.
<i>Primary sore</i> —extragenital.	<i>Primary sore</i> —usually genital.

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YAWS—*continued*

Secondary Stage

- (a) Typical yaw pathognomonic ; furfuraceous desquamation and plantar lesions characteristic.
- (b) Mucous membranes not affected.
- (c) Itching common.
- (d) Alopecia unknown.
- (e) Eyes unaffected.

Tertiary Stage

- (a) Visceral lesions absent.
- (b) Nervous system never seriously affected.
- (c) Blood-vessels : no endothelial proliferation as in syphilis.

Yaws better resisted. Constitutional disturbance slight ; great exuberance of eruption and cheiloid scarring.

Does not respond to mercury.

SYPHILIS—*continued*

Secondary Stage

- (a) Seldom imitates frambœsia.
- (b) Mucous membranes affected.
- (c) Itching rare.
- (d) Alopecia may occur.
- (e) Iritis common ; choroiditis and retinitis rare.

Tertiary Stage

- (a) Visceral lesions occur, *i.e.*, pericellular cirrhosis, gumma of liver, kidney, etc.
- (b) Nervous system prone to infection : tabes, G.P.I.
- (c) Endarteritis obliterans of viscera—cerebral thrombosis.

Syphilis attacks constitution, affecting the vital structures.

Responds well to mercury.

Treatment.—I will shortly touch on this subject, just in order to emphasise the points in which the treatment differs from that of syphilis. The first is the almost instantaneous and miraculous response of yaws to salvarsan. In the secondary stage one injection seems to suffice. Even in tertiary lesions not more than three injections are rendered necessary. In Samoa it has been found necessary to give three injections of N.A.B. of 0.6 gramme at weekly intervals, and appropriately smaller doses to women and children. Babies stand intramuscular injections well. As noted by Swediaur, yaws cannot be cured by potassium iodide and mercury, but bismuth (Bismostab), used as in syphilis, has been found to be remarkably efficacious. Three or more injections are necessary, and this drug has been found to be of the greatest use in mass treatment, as is practised now in Kenya and Tanganyika Territory, the great objection being the stomatitis which is liable to supervene. Stovarsol, which can be given in tablets by the mouth in doses of 1 gramme daily, has been found to be convenient and efficacious. A total course of 15 grammes is considered sufficient to effect a cure.

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I am afraid I have wearied your patience, but I cannot conclude this rather prosaic description of yaws without appealing for a further and more intense research into many of the points I have brought forward. The time is now ripe for such an inquiry. I would like to see this Society as the means of stimulating such a research, especially as to the exact relationship of yaws to syphilis, and as to the absence or reputed absence of nerve affections in yaws. This could be well carried out in British or Mandated Territories, such as Fiji or Samoa, at a relatively small cost by an expert team. I mean a team which would include clinicians as well as pathologists, and who would investigate the serum and cerebrospinal fluid by the most modern methods.